Conscious Product Design Semiotics In Indian Industry: A Systems Approach

Synopsis

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SECTION I

INTRODUCTION

Today we are standing before a functional, technological and environmental tidal wave. Within product and services design; appropriate technological criteria, maximum functionality and adequate environmental sensitivity have set the pace for future innovation. They together form a cohesive and unified whole giving fuller response to the changing socio-economic-environmental needs of the global society. We find ourselves today at a point where functionality, technological capability and environmental sustainability of a new product's design are invoking utility-meaning, aesthetical appeal and preference for the product by the target users. These attributes of innovative product designs are quite prevalent in the very tangible form of buildings, products and art that constitute our material culture.

A systemic study of this phenomenon requires an attempt to analyse how we can understand the role played by these complex designing attributes of 'Product Semiotics' under designer's and user's perspectives. By being conscious of it and applying the same, one can be better equipped to design and use the products of the future.

1.1 CONSCIOUS PRODUCT DESIGN SEMIOTICS: ANTECEDENTS

According to John Deely, President of Semiotic Society of America, human beings possess **'semiotic consciousness'** (Codley, 2010). As Max Velmans and Susan Schneider wrote in The Blackwell Companion to Consciousness: "Anything that we are aware of at a given moment, forms part of our consciousness, making conscious experience at once the most familiar and most mysterious aspect of our lives", thus consciousness is highly cognizant of the variety of signs in the environment and semiotic-insight formation.

According to Merriam Webster Dictionary, **"Semiosis is the process in which something functions as a sign to an organism".** Semiosis builds links between objects and grounds; ad infinitum. Semiotic Consciousness is ubiquitous and omnipresent. Perhaps, no non-semiotic places exist in our cognitive processes. These processes are built upon the interpretative reflection of the possible linkages between grounds and objects (Tochan, 2001).

According to Francois Tochan (2001), semiotic consciousness is (1) perceptual of diverse grounds (2) representational of objects (3) interpretative of possible causal links between perceptions and representations. Thus, semiotic consciousness can be appositely applied to product designing.

Klaus Krippendorff in his book, 'A New Foundation for Design' (2006) has suggested design practices in a human-centered design culture. He has proposed a systematic inquiry into how people attribute meanings to artifacts and interact with them accordingly. This study he terms as **'Product Semantics'.**

Semiotics is trifurcated – **Semantics, Syntactics and Pragmatics. Semantics** studies the actual meaning/literal/direct meaning of the sign**. Syntactics** studies the relationship between

different signs and **pragmatics** studies the contribution of environment and context in meaning-making.

Thus for reaching an optimal product design decision, consciousness studies and semiotic approaches can be the most felicitous choices since the product is made up of a plethora of signs and it's form, shape, texture, colour, etc. communicate various aspects and should be studied in depth to gain holistic consciousness.

1.2 PRODUCT SEMANTICS & DESIGN DECISIONS

According to Margarita Vergara and Salvador Mondragón (2004), an emotional product design has feelings as the very lynchpin and tries to emanate the perceptual emotional attributes of both designers and users. In doing so, **semantic adjectives** are used to transmit what designers and users perceive in a product and further influence the consciousness of both the designers and the users.

According to Krippendorf and Butter (1984), "Product Semantics is the study of the symbolic qualities of man-made forms in the context of their use and the application of this knowledge in industrial design."

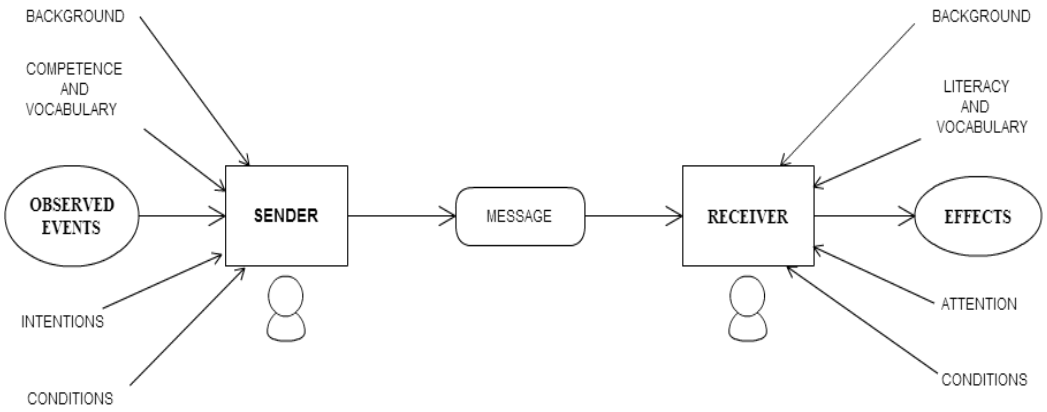

Figure 1: Design Communication Process (Krippendorff and Butter 1984)

A study of psychological, functional, technological, environmental and social uses of objects is carried out by the designer who then communicates messages to the user by employing linguistic and non-linguistic symbolic qualities. Product designs are composed of socio-cultural histories of both synchronic and diachronic types.

Product semantics is not a new style; it is a very thorough and serious study of meanings that emerge in human interaction with objects (Krippendorff and Butter 1984).

While Krippendorff has emphasized socially constructed meanings, Butter advocates a more pragmatic step-by-step method to correct design. Product semantics thus leads to optimal design decision as designers can demystify complex technology and improve the overall interaction.

Thus for finding the attributes that make explicit what the user perceives and uses to judge every product is the semantic design products goal, which has a wide canvas that involves from engineers to psychologists and considers the product as a bearer of messages composed of shapes, wishes, emotions or memories. The present study shall confine to study some dominating attributes of contemporary and futuristic product design semiotics like – Functional, Technological and Environmental attributes. Perhaps IT enablement could aid the basic human creativity to increase the speed and rapid prototyping in delivering the desired output much faster.

1.3. SYSTEMS APPROACH OF PRODUCT SEMIOTICS DECISION- MAKING

The systems thinking helps decision makers to take holistic view of the product design problem situation in order to arrive at effective solutions and strategies. In the area of product semiotics, the fact that the process of designing or product innovation and consumer feedbacks are separated by time and space due to the inherent process of production, marketing and distribution implies the need for a holistic or systems approach to design decision making. It is quite the opposite of traditional approach practiced in most marketing organizations.

The traditional approach to problem solving is reductionist approach, which involves breaking down the whole semiotic system into internally manageable pieces and then analyzing each piece in isolation. This view is implicitly a linear view of the product semiotics management, treating it merely as a sum of the behavior of its parts. The real behavior of a semiotic system however is more than just the sum of its parts, particularly under broader socio-economic-environmental contexts.

In this regard, it is evident that in the nature of things, the variable/ component function of 'product semiotics system' is interrelated and hence need holistic and coherent handling, both from designers and consumers perspectives. In brief, because of the interrelationship among the different influencing variables and their dynamic complexities, it would be necessary and desirable to look at the product semiotic decisions as a single unified system and optimize the efficiency of decision making as a whole.

This is precisely what an applied "Systems Approach" of product semiotics means. Such an approach will facilitate better and insightful understanding about the dynamics of various auxiliary functions and influencing variables effecting product designing decisions in the Indian industry.

According to Prof. P.S. Satsangi (2001), "Applied systems research addresses real world problems concerned with complex, unstructured, multidisciplinary, large scale systems which require acquiring information of the system and its components and environment…which seek approximate solutions to precisely or imprecisely formulated problems."

1.4. CONCEPTUAL FRAMEWORK OF RESEARCH

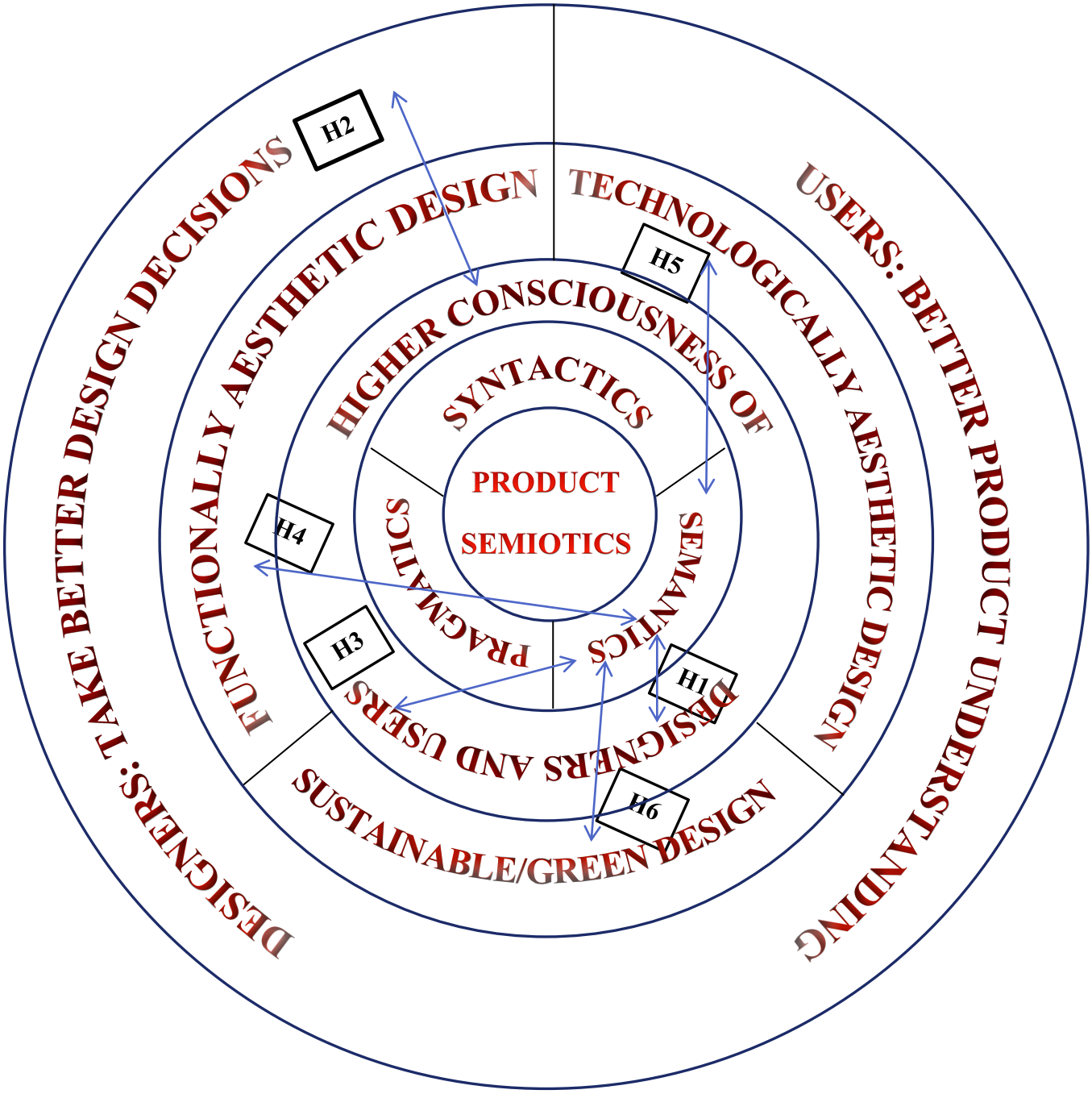

Fig 2. Conceptual Framework of Research

Conceptual model (Ref. Figure 2) shall be the basis for proposed study. The Conceptual Research Model shows that 'Product Semiotics' (the study of product design signs and symbols, in particular their relationships with the things they are meant to signify.) is trifurcated into – Pragmatics, Semantics and Syntactics. It is hypothesised that the study of Product Semantics (The study of meanings in linguistic and non-linguistic expressions in product designs.) leads to higher semiotic consciousness of designers and users. This semiotic consciousness further helps the designers to take better design decisions which could be ramified into – functionally-aesthetic, technologically-aesthetic and sustainable/green design product designs. Also the users gain better product understanding with higher semiotic consciousness of the products.

SECTION II

REVIEW OF LITERATURE

Based on the conceptual framework, some antecedents and consequences were arrived at, after which a detailed study of the literature review and gaps identification led to generation of hypotheses surrounding these antecedents and consequences.

2.1 PRODUCT SEMANTICS & DESIGNERS' AWARENESS

Contemporary Semiotics has moved away from the classification of sign systems to study how meanings are made and are not only being concerned with communication but also with the construction and maintenance of reality. Studying semiotics can assist us to become more aware of reality as a construction and of the roles played by ourselves constructing or designing it.

Regardless of how designers use color, shape, form, and texture in designing the product, messages are being sent through products via a part of language structures that deal with meaning, called semantics.

This implies that designers and ergonomists should not only know what message(s) they wish to transmit and the sort of response(s) that can be expected from the user being the receiver, but also the symbols and attributes forming that language.

A product tells us something, about itself and in certain cases also about the human being who owns it. Through its design and function, the product expresses values, whose importance individuals then interpret and value in relation to a certain social context in terms of acceptance or rejection, liking or disliking. However, the product can, through its semantic content and expression, either strengthen or weaken this role, in this way creating positive or negative perceptions, emotions, values and associations within the individual person (Wikström 1996).

The semantic functions provide the designer with the possibility to communicate a clear message through the product. This means that the designer has to make clear to him/herself what should and what should not be communicated through the product (Wikström 1996). Thus Product semantics is a very powerful study under the masthead; Semiotics which helps the designer gain consumer insights and create a product design which results in designers' awareness.

There have been a number of valuable studies on the relationship between product semantics and designer's awareness (Archer, L. B. 1964, Krippendorf, K. and Butter, R. 1984, Butter, R. 1987, Athavankar, U. 1989, Buchanan, R. 1992, Norman, D. A. 2005, Glanville, R. 2007, Chakrabarti, A. and Gupta, A. 2007) all of which present accounts on the comprehension of designer-psychology and semiotic intervention. However, none of these studies provide an integrated approach which encompasses systemic methods, semiotic consciousness and study of ubiquitous elements like functionality, technology and environmental impact. Spirituality and Consciousness studies are picking pace in the India, a semiotic perspective will give a three-dimensional vision to the existing literature.

The field of Semiotics holds great potential for Indian designers. Contribution to analysis, development and evaluation of 'Product Designing in Indian Industries' is the demand of the day in present global village. As Semiotics provides a three-dimensional vision; designers will gain immensely with the awareness of every facet in designing.

Based on the above discussion, we propose the following hypothesis:

Hypothesis H1: Product Semantics leads to higher semiotic consciousness of designers.

Hypothesis H2: Higher semiotic consciousness of designers leads to better design decisions.

2.2 PRODUCT SEMANTICS & USER ORIENTED DESIGNS

The term product semantics was first coined by Klaus Krippendorff and Reinhardt Butter in their 1984 essay 'Product Semantics: Exploring the Symbolic Qualities of Form' which redefined the role of product design as "the conscious creation of forms to serve human needs". The new approach is concerned with "the symbolic qualities of man-made forms in the context of their use and the application of this knowledge to industrial design".

The 'semantic' of a product moves beyond the traditional 'form follows function' equation to include social, technical, and cultural communication as well. The contemporary designer acts more as a communicator working with visual gestalts, physical and cognitive affordances, materiality and manufacturing processes to develop products with a deeper connection to the life and needs of the end-user.

Semantic Differential (SD) is a measuring instrument to obtain the connotative value of an object or an image. A pioneering work in this field was "The Measurement of Meaning" (Osgood, 1957) which is a study of "affective meaning", i.e. the emotional reactions that accompany an image. A subject is shown an object or image and asked to give a subjective opinion of it. This judgement is to be given according to a scale with two opposing adjectives, for example comfortable / uncomfortable or fragile / sturdy, and the subjects are asked to rate the image and place it somewhere on the scale.

The semantic differential procedure does not provide information about the meaning of the object or image, but instead only about the emotions it generates. It is applicable since it is through words with an emotional meaning that we are able to read, understand and interact with objects. This procedure has been applied in a wide range of fields, such as high voltage pylons, telephones, mascots, street furniture, cars, etc.

While there has been some research on the emotional impact of product designs on consumers and employing the same knowledge back in designing process (Krippendorf, K. and Butter, R. 1984, Umiker-Sebeok, J. 1987, Vihma, S. 1990, Roozenburg, N. F. M. and Eekels, J. 1995, Wikstrom, L. 1996, Cobley, P. and Litza J. 1997, Bouchard C, et.al. 1999, Petiot, J.F. and Yannou, B. 2003, Vergara, M. and Mondragón, S. 2004) , little has been written about the effect of the same on the semiotic consciousness of product users and how this perspective helps the consumers to understand the product better; functionality, technology and sustainability wise.

Indian culture is motley garbed. Indian designers need to understand the synchronicity of effects brought by culture, religious beliefs, language, standard of living, literacy level, etc. on users' psyche to holistically understand user-orientation. This knowledge needs to 'talk to the user via product design'. User-oriented designs need to be produced in the India business arena so as to gain competitive edge as users would relate to the products and understand unique-selling propositions of the product and better making it a win-win situation for both designers and users.

Hypothesis H3: Product Semantics leads to higher semiotic consciousness of Product Users.

2.3 PRODUCT SEMANTICS & TECHNO - FUNCTIONAL - AESTHETIC DESIGN

As accounted by Ulrich and Eppinger (2000), product success can only be achieved if the product satisfies needs and offers perceived benefits to the customer. Within the context of industrial design, designers should have a good insight in customer' and end consumer' needs, as they do not have the luxury of dealing with a single customer, in person.

As an integral part of the product development process, product management and marketing knowledge is essential to identify potential users. In this context, it has been argued that the growing alliance between design, mass production and mass consumption is the most powerful and constraining factor in the last two centuries. As mentioned by Archer (1964) a complex interaction of factors arises from three key aspects of industrial design—function, marketing, and manufacturing.

These occasionally conflicting factors always compete, but finally some form of reconciliation is expected in an end product." The design problem is highly influenced by the user at the very beginning. As designers attempt to redefine the design problem during the process, it is quite difficult for designers to identify user's needs. (Lawson 1997). Thus environmental perspective is of paragon importance as has been illustrated in Fig. 3, a detailed study of general as well as specific environment has to be done to comprehend the same.

Aesthetics is the science of sensual perception. Aristotle tried to define the relation between the artist, the artwork and the art consumer. (Butcher, S.H, 2012) He understood sensual perception as the interaction between order, balance and limitation. He used the terms Poiesis, Mimesis and Katharsis. These also visualize the principal structure of semiotics. Kant had stated: *"An object, which pleases the senses, is perceived as delightful and provokes interest in the existence of the object."* (Kant, I, 2006)

Product Semantics will facilitate the generation of product designs with better functional and technological understanding for example the designer might use Icons, Indexes or Symbols drawing inspiration from Peirce's trifurcation of signs - Icon – (Icon is a sign that resembles something, such as photographs of people. An icon can also be illustrative or diagrammatic, for example a 'no-smoking' sign.), Index – (Index is a sign where there is a direct link between the sign and the object. The majority of traffic signs are Index signs as they represent information which relates to a location (e.g., a 'slippery road surface' sign placed on a road which is prone to flooding) or Symbols (Symbol has no logical meaning between it and the object. Flags are symbols which represent countries or organizations.) Then a pragmatic study (the doctrine that practical consequences are the criteria of knowledge and meaning and value) can be carried out keeping the consumer's orientation and environment

in mind and his/her wide array of responses to these signs used in product designs in the IT industry like designing icons for mobile screens.

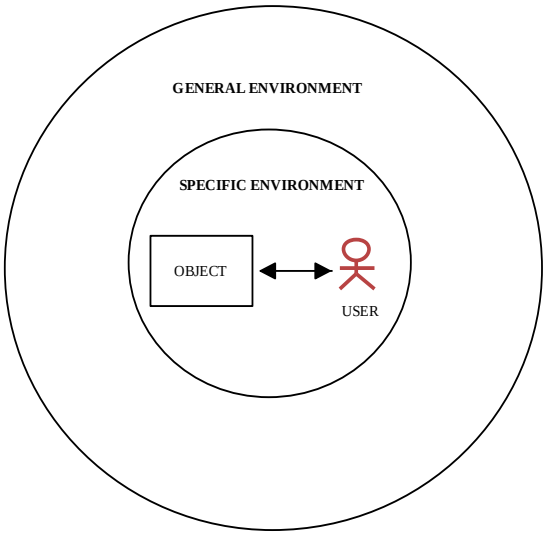

Figure 3: Pragmatic Functional Design: Relationship between User, Product and Environment (André Liem, Li Suping, 2002)

According to Pheasant (1987) from a User Centered Design point of view, if an object, an environment or a system is intended for human use, then its design should consider the characteristics of its users placed in that given environment. Ergonomics as a science is central here. The same can be explained with the help of figure 3. According to White (1983), the major role of contextual analysis in design is the acquisition of knowledge about the site prior to commencement of design activities, so that early thinking about the building can incorporate meaningful responses to external conditions. Some functional attributes could be - Efficient / Inefficient, Tardy / Streamlined, Vivid / Dull, Powerful / Weak, Agile/Rigid, Simple / Complex or Complicated, Idle / Active, etc.

With the exponential rise in Media, Communication and IT industry in India, designers need to embellish product designs keeping their technological and functional features in mind. Recently Apple sued its component supplier Samsung, alleging in a 38-page federal complaint on April 15, 2011 in the United States District Court for the Northern District of California that several of Samsung's Android phones and tablets, including the Nexus S, Epic 4G, Galaxy S 4G and the Samsung Galaxy Tab, infringed on Apple's intellectual property: its patents, trademarks, user interface and style. Thus a pragmatic analysis of functional and technological-aesthetic product design needs to be done before putting the products on launch pad.

Product Semantics can ensure originality, genuineness and authenticity of products. It can help distinguish not only between competing brand design but also imitative practices done by lesser known players. India is a growing market for local as well as foreign players. Thus taxonomy and meaning-making of different signs is imperative. Not many studies can be found on the jointure of functional-aesthetic and technologically-aesthetic product designs being facilitated by product semantics. Existing literature shows us either the facilitation of product semantics in producing an aesthetic product design or we can find functional and technological aspects being taken into focus (Wittgenstein, L. 1979, White, E.T. 1983,

Pheasant, S. 1987, Vihma, S. 1990, Kant, I. 2006, Alsted C., Larsen H.H., Mick D., Busk A., 2006). However, if it is argued as to how aestheticism should abridge function and technology, a need for study on the same is desirable.

Accordingly two more hypotheses are stated below:

Hypothesis H4: Product Semantics facilitates a functionally-aesthetic product design.

Hypothesis H5: Product Semantics facilitates a technologically-aesthetic product design.

2.4 SUSTAINABLE DESIGN/ GREEN –AESTHETIC DESIGN

Sustainable design is an offshoot of both environmental studies and economic theories. The emerging semantics of sustainable design suggests that designers must become "ecologically intelligent", requiring them to obtain substantial knowledge of sustainable design and apply the principles of "good design" with "eco-friendly design" in their work. Good design will stand the test of time and will hopefully be kept for much longer, therefore reducing the constant need for new products and reducing the materials and energy required to produce them. A concept that has attracted much interest in the design profession is "bio-mimicry". Over the past two centuries, we have witnessed many design movements that centered on natural forms. Bio-mimicry on the other hand is much more sophisticated and demanding than the mere imitation of forms in nature. It demands designers to draw inspirations from the anatomy, physiology, and behaviors of living systems that have developed for millions of years. Sometimes these biological traits might be difficult to convey in physical forms because they exist at the microscopic level. For instance, designers will need to find ingenious ways to communicate to the users a biomimetic surface structure of a new adhesive material that was inspired by the soles of reptilian feet that naturally stick to glass and other non-porous materials.

Nature works from a 'bottom-up' method so as not to produce waste unlike the human process which is generally 'top-down' beginning with material extraction and continuing through to manufacturing and distribution. While it is impossible to remove or transform all of our processes it is certainly possible to make them more efficient, repairable, and customizable so that individuals have a great stake in holding on to products they were partially responsible. Product Semantics provides a holistic approach to examine how nature can be/has been sought inspiration from. Eco-friendliness and sustainable designs can be signified through product designs; the analysis can be made from material use, shape dynamics, nature inspiration, colours used, etc. Many studies show us the relationship of semiotics and biology i.e. Biosemiosis like (Sebeok, T.A. 1992, Kull, Kalevi 1999, Favareau, D. 2010) but it remains a matter of serious concern that there is no research-based model designed in India for the same.

Thus the following is hypothesized:

Hypothesis H6: Product Semantics facilitates a sustainable/green product design.

SECTION III

3.1 RESEARCH HYPOTHESIS

Based on the discussion in the previous section, the set of six research hypotheses are stated below:

Hypothesis H1: Product Semantics leads to higher semiotic consciousness of designers.

Hypothesis H2: Higher semiotic consciousness of designers leads to better design decisions.

Hypothesis H3: Product Semantics leads to higher semiotic consciousness of product users.

Hypothesis H4: Product Semantics facilitates a functionally-aesthetic product design.

Hypothesis H5: Product Semantics facilitates a technologically-aesthetic product design.

Hypothesis H6: Product Semantics facilitates a sustainable/green product design.

SECTION IV

AN OVERVIEW OF PROPOSED RESEARCH

4.1 NEED OF STUDY

Semiotics is of paramount importance in the world of strategic brand management because it helps in creating brand emotions, brand identity, brand renovation, brand innovation, brand advertising, brand awareness - brand recognition and brand recall, visual brand management strategy so on and forth. Semiotics is the very lynchpin of strategic brand management because it creates brand emotions which are directly linked with the making of any product an instant hit or knock-off.

According to Saussure, "a sign is more than the sum of its parts" thus the process of signification is to be holistically analyzed which is perfectly facilitated by semiotics."

The Semiotic Analysis of logos, backgrounds, shapes, sizes, packaging and product design of products help us to understand brand management in a holistic manner. Some reasons why semiotics is of great importance have been mentioned below:

1. Encompasses anything that might be regarded as a sign – Icon, Index, Symbol or non-linguistic signs. In the likes of Barthian tradition – olfactory, tactile, auditory, visual, gustatory signs can lead to myriad brand emotions.

2. As David Sless notes (1986), "we consult linguists to find out about language, art historians or critics to find out about paintings, and anthropologists to find out how people in different societies signal to each other through gesture, dress or decoration. But if we want to know what all these different things have in common, then we need to find someone with a semiotic point of view, a vantage point from which to survey our world". Semiotics is an approach that abridges a wide array of fields; from anthropology to systems approach.

3. Searching for what is "hidden" beneath the "obvious" can lead to fruitful insights. Semiotics is also well adapted to exploring *connotative meanings*. Social semiotics alerts us as to how the same text may generate different meanings for different readers. Those who cannot understand such environments are in the greatest danger of being manipulated by those who can". Thus semiotics helps to acquire competitive advantage for businesses. Signs do not just "convey" meanings, but constitute a medium in which meanings are *constructed*. Semiotics helps us to realize that meaning is not passively absorbed but arises only in the active process of interpretation. Semiotics could help us to realize differences as well as similarities between various media. It could help us to comprehend why one existential semiotic mode is to be placed over another, such as the spoken over the written or the verbal over the non-verbal. (Daniel Chandler, 2002)

4. As Gunther Kress and Theo Van Leeuwen (1996) propose, 'different semiotic modes - the visual, the verbal and the gestural... have their potentialities and their limitations'

7. Semiotics helps us to realize that meaning is not passively absorbed but arises only in the *active process of interpretation.*

Living in a world of increasingly visual signs, we need to learn that even the most "realistic" signs are not what they appear to be. By making more explicit the codes by which signs are interpreted we may perform the valuable semiotic function of "denaturalizing" signs. The study of signs is the study of the construction and maintenance of reality. To decline such a study is to leave to others the control of the world of meanings which we inhabit.

Managerial Implication/Study Benefits –

The research will help to bridge the gap among designer, consumer and producer/entrepreneur communities as consumer expectations, insights and understanding level will be communicated to the designers who would keep the same in mind and help the consumers understand the utility of the product on technological and functional level. A more personalized and consumer centered design will be generated which will also include aesthetical, environmental and sustainability related value points. Today's consumer being environmentally conscious and aesthetically sound will appreciate the same and the entrepreneurs will be able to achieve better brand management.

The proposed model will provide an opportunity for designers and researchers to help entrepreneurs gain a deeper understanding of the overall product value. A systemic, structured and level to level study in which different product semantic profiles will be studied by analyzing the collected semantic clusters. A comparative analysis on various parameters like design, art, culture, aesthetics etc. will be facilitated by the same.

For other researchers also taxonomy will be developed and will benefit the designer, entrepreneur and user communities. Thus, abstraction and subjectivity will be done away with and will move the design towards an optimal design. The emotive value in given product design as identified by the consumer and designer will be collected as adjectives. First-hand information and deep understanding of consumer insight on different dimensions will be collected by the proposed model.

The proposed model will include an evaluation system that will have evaluation instruments like semantic scale, rating points; quantitative tools etc. the data from which will be winnowed on different levels to reach clear cut understanding on different levels. This will greatly help the entrepreneurs as abstraction will be done away and they will be able to understand the total value of their product.

4.2 OBJECTIVES

The objectives of the present research are:

Objective 1: To study the concept, role and significance of Conscious Product semiotics for innovative product design under the changing business scenario.

Objective 2: To analyze the functional, technological and environmental attributes of product semiotics and aestheticism.

Objective 3: To discover the impact of Product semiotics on the decisions of Product-designers and Product-Users.

Objective 4: To construct a Systems Decision-support model of innovative product designing for Indian Semioticians.

The underlying theme of this research will be to systemically explore the prospect of Product semiotic consciousness in the field of Innovative Product Design in India and to sensitize the product designers and users to appreciate its value in responding to the dynamic business environment under a vibrant social context.

4.3 SAMPLE-PLAN

The following product categories have been selected:

- Consumer Electronics
- Home Appliances
- Personal Hygiene
- Home Décor

The above product categories have been selected as they offer a wide breadth of choices on which technological, functional, environmental and aesthetic values can be studied and conscious decision-making can be analyzed using semiotic approaches and consciousness studies.

Under these categories the sensual functions, perceptions, interplay of design, art, culture, anthropology etc. can be easily studied and semiotic approaches like Pragmatics, Semantics and Syntactics can be used to develop product semantic profiles. Comparative analysis and evaluation can be carried out with ease on the same developed profiles in different abovementioned categories.

4.3.1 SAMPLE COMPOSITION AND SIZE (Respondents)

Taking a statistical approach for calculation of sample size, the various quantitative measures to be considered while determining the sample sizes are as follows:

a) Variability of population characteristics or standard deviation (s)

b) Level of confidence desired or Z value (taken as 1.96 for 95% confidence level desired).

c) Degree of precision desired in estimating population characteristics (D)

We have considered the following formula for testing hypothesis around mean –

$n= s^2\ Z^2/D^2$

Here n = sample size

s = standard deviation

Z = standard normal variate for 95% confidence level

And D = degree of precision desired

In order to obtain a representative and realistic sample size we have compared the results of sample size from 3 scenarios:

Scenario 1: Estimating a low standard deviation and high degree of precision.

Scenario 2: Estimating a moderate standard deviation and moderate degree of precision.

Scenario 3: Estimating a high standard deviation and low degree of precision.

The results are summarized in Table 1

Table 1: Comparative analysis taking different values of s and D

	I	II	III
s	0.5	0.25	1.0
Z	1.96	1.96	1.96
D	0.09	0.10	0.11
n	119	216	318

Overall n = $(n_{1+}n_{2+}n_3)/3$ i.e. 119+216+318/3 = 218

The above sample size will be applicable to relatively homogenous population of product users. In addition, the other categories of respondents (and sample size) are listed below:

- **Product Designers** – Amateur and Professionals: 50

- **Product Users** – I. Innovators: 18 to 20 & II. Imitators: 100, Total (I+II) = 118 to 120
- **Others:** Academic Institutions, Designing companies, R&D Departments, Industrial/Product Designing Centers:- 50

Therefore, **Sample Size = 50+218+50 = 318**

4.3.2 SAMPLING TECHNIQUE

The sampling techniques to be employed are:

Judgemental and Convenience Sampling

4.3.3 INSTRUMENTS OF DATA COLLECTION

The instruments to be used are:

- Survey Questionnaire
- Personal Interviews
- Secondary Data Research

4.3.4 STATISTICAL TECHNIQUES

The study will make extensive use of both descriptive (e.g.; pie charts, bar graphs, tabular summary) and inferential (e.g.; statistical tools such as t-test, z-test, etc.) techniques.

4.4 RESEARCH METHOD FOR RESPONDENT INVESTIGATION

In order to produce a conscious product design, we have ramified semiotic analysis into the under mentioned stages:

- **Selection of Semiotic Products**: Samples of products belonging to the same product category from the usage function but different perception point of view/mental representation are to be produced before the subjects.

- **Creation of Semantic Space**: Subjects (both designers and consumers) have to describe their perceptions about the product freely in three steps:

- Semantic Response: A list of overall signified concepts/images/expressions have to be described by the subjects in the form of adjectives **(Functional – Technological - Environmental)**

- Syntactic Response - Product design signifiers have to be closely observed and their relationship with each other is to be described.

- Pragmatic Analysis - The subjects have to check attributes (in the provided checklist) that best match the product design signification on the basis of Silverstein's pure indexes like various deference and gender indexes. A list of relevant semantic criteria is extracted from this description.

- **Determination of the perceptual space**: Here perceptual differences between products will be comprehended.

- **Raw determination of the semantic space**: Here the subjects' perception of a product and explanation of the reasons for product differentiations will be studied.

- **Fine tuning of the semantic space**: Here products shall be weighted under each semantic attribute.

- **Design stage**: Starting from the specifications, design decision-models will be proposed.

4.5 RESEARCH DESIGN FLOWCHART

The methodology adopted in this research study is depicted in the flowchart (Figure 4). After carrying out extensive literature survey, development of conceptual framework shall ensue, after discussion with experts, academicians, semioticians and market researchers questionnaires shall be designed. Expert Opinion shall be pursued for the finalization of questionnaire after which the data shall be collected. The next step will be to analyse the data statistically, after which the findings shall be synthesized. Final results, limitations and conclusions shall compose the last step which shall be followed by recommendations.

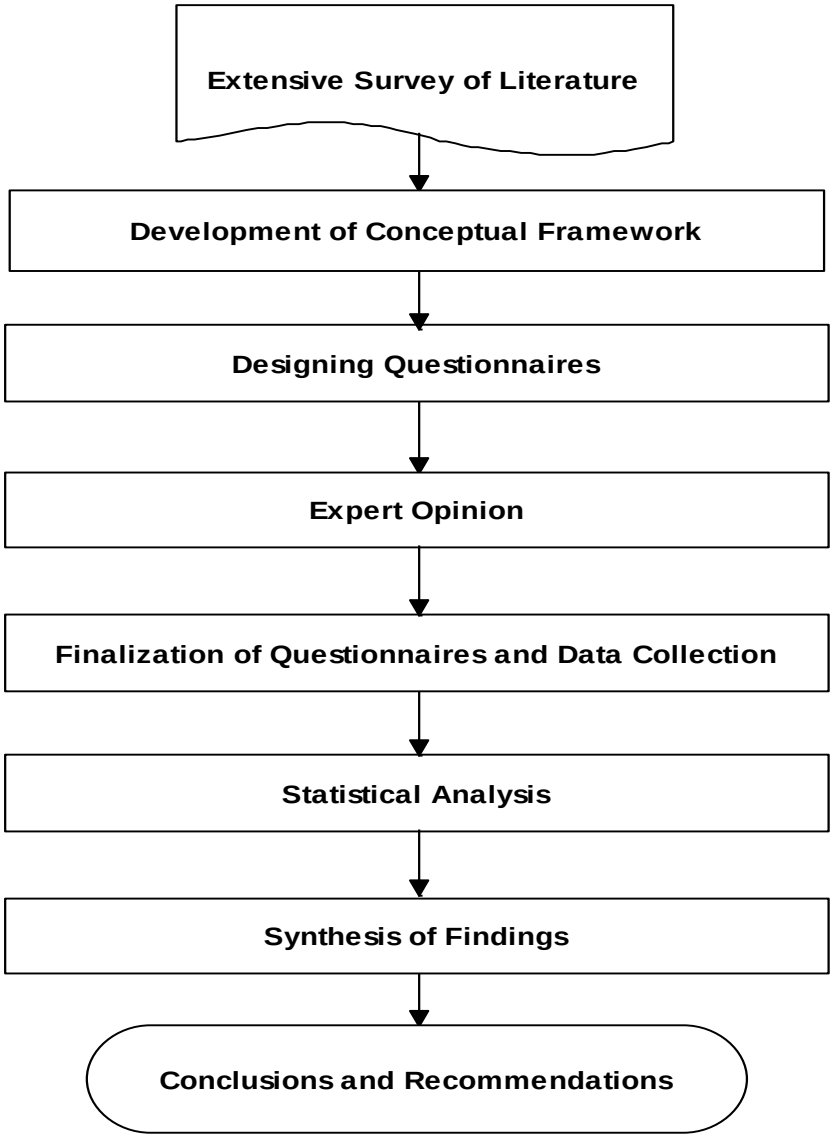

Figure 4: Research Design Flowchart

SECTION V:

CHAPTERIZATION

The thesis will contain the following chapters:

Chapter 1: Introduction

Chapter 2: Review of Literature

Chapter 3: Conceptual Framework

Chapter 4: Research Design and Methodology

Chapter 5: Data Collection and Analysis

Chapter 6: Results and Interpretation

Chapter 7: Conclusion and Recommendation

Chapter 8: Bibliography and References

Appendix

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